

ART. III.—*Notes on the Lower Tertiaries of the Southern  
Portion of the Moorabool Valley.*

(With Plates III and IV.)

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The occasion of the visit of the University Science Club to Geelong for their long-vacation trip enabled us to make some observations on the geology of this locality.

The course of the stream, from its sources to the eastward of Mount Warrenheip down to its junction with the Barwon at Fyansford, near Geelong, is across the eastern portion of the great volcanic plain of South Western Victoria. Like most of our streams flowing through basaltic country, it has cut a deep and narrow valley of its own, and has in many places exposed the underlying deposits. In the upper part of its course, these underlying deposits are of lower silurian age, while in its lower part they consist of tertiary strata.

Our observations dealt principally with the older tertiary deposits, and extended from the railway viaduct, near Batesford, down to the junction of the stream with the Barwon at Fyansford.

GRANITE.

The oldest rock exposed is the granite, an outcrop of which, about a square mile in extent, occurs at the Dog-rocks near Batesford. Another outcrop, a few yards in extent, occurs where the Maude Road crosses Sutherland's Creek at Darriwill, ten miles from Geelong; and probably granite occurs at no great depth beneath the surface everywhere between the Dog-rocks and the granite hills of the You Yangs.

## LOWER TERTIARY.

Half a mile below the viaduct, on the left bank of the stream occurs a section which is noted as fossiliferous in the geological quarter-sheet. This section is marked (9) on the plan. Lately a small road cutting along its base has afforded easy means of better examination of the beds. The section is fairly typical of all that occur in the valley. The lower portion consists of a dark grey clay, containing a great deal of shelly matter. This becomes yellower as it passes upwards, and contains a slight admixture of sand. Concretionary masses of calcareous material make their appearance, and in places form compact irregular bands. Fossils, especially gastropods, are more plentiful at the base of the series, while in the upper part lamellibranchs, and also brachiopods occur, the gastropods being exceedingly rare. We record 122 species from this locality.

There is no doubt that the deposit represents but one series of beds. The passage from one kind of sediment to another is a gradual and not a sudden one. The beds merge into one another in such a way as to leave but little doubt that the process of sedimentation was continuous, and though certain fossils abound more in certain parts than in others, the difference is due to a variation in the sea bottom, due to different material being deposited, and to the depth at which the deposit took place, and not to a great difference in age, as the lamellibranchs and brachiopods of the upper beds occur also in the lower members of the series.

Near the Dog-rocks, the polyzoal limestone makes its appearance, and in one or two places forms low cliffs on the river bank. The beds when examined at a distance show a slight dip, which is approximately to the south east. We were, however, unable to measure its amount and direction accurately. The lowest beds exposed are at the upper quarry (see plan 8). The rock here is almost entirely made up of foraminifera, which lie at all inclinations to the bedding plane. A sample of the rock was forwarded to Professor Tate, and by him submitted to Mr. W. Howchin. This gentleman states that the great mass of the rock is made up of individuals of *Orbitoides mantelli*, and he suggests the name *Orbitoides limestone* for the formation. The other conspicuous genera, which however are relatively few in number, are *Amphistegina*, *Operculina*, and *Gypsina*. The rock is very friable and is quite distinct from the overlying

polyzoal limestone which, however, contains similar foraminifera freely scattered through it, though its great bulk consists of polyzoa and spines and plates of echinoderms, together with a few lamellibranch shells; 14 species are recorded from this locality.

The base of the section is hidden by the drift of the valley, but judging from the close proximity of the granite, it is of no great depth.

The hill section is as follows:—

Basalt	...	...	...	75 ft.
Incoherent sandy material, with calcareous concretions	...	...	...	50 „
Yellow clay, with calcareous concretions	...	...	...	5 „
Polyzoal limestone	...	...	...	25 „
Orbitoides limestone	...	...	...	20 „
Total				175 ft.

The change from the limestone to the yellow clay at this point is a sharp and not a gradual one. The grey clay which, as before mentioned, is so abundant in gastropoda, is absent, having thinned out towards the granite on the flanks of which the deposit rests.

The polyzoal limestone at the places marked (7) and (8) in plan is of a lighter tint than that of the well-known Wauru Ponds rock, being in places of a dazzling whiteness; but fossil evidence shows the two deposits are of the same age. We record 16 species from the filter quarries (see plan). Near Madden's (see plan 6) a cliff section shows the following interesting characters:—The polyzoal limestone forms the base of the cliff. This rock in its upper portion is in most places of a crystalline texture, and very few perfect shells are to be found in it, the fossils being represented principally by casts. A similar state of things occurs on Sutherland's Creek near Maude, though in the latter place gastropods, especially cowries, are plentiful; while in the true polyzoal rock, they are extremely rare. Above the limestone comes the clay bed. This for the first few feet is full of polyzoa, resembling those of the lower rock. The beds then pass up in the usual manner into sandy calcareous clays with nodules, and are capped by basalt.

Though the line of demarcation between the polyzoal rock and the grey clay is sharp, still, as has been just mentioned,

the foraminifera persisted during the time required for the deposition of the first few feet of the clay. The muddiness of the water, however, was apparently inimical to the growth of polyzoa in the profusion in which they had previously existed, and they soon ceased to be the typical forms of life in the locality, and the gastropods made their appearance in greater numbers. The effect of the variation in the sediment on the fauna has been alluded to when dealing with the section near the viaduct.

The section is as follows :—

Basalt	...	...	...	60 ft.
Incoherent sandy material, with con-				
cretions	...	...	...	20 „
Yellow clay, with concretions			...	50 „
Grey clay	...	...	...	20 „
Polyzoal limestone		...	...	30 „
Total				180 ft.

The hill side is covered by a fairly deep soil, but in a few places, especially where rabbits have burrowed, the underlying rock is exposed. Fossils are scarce, but by dint of a few hours' careful searching, we succeeded in securing examples of thirty-five species, which will be found recorded in the list given.

Below Madden's, the river valley widens out to about three-quarters of a mile. The bed of the stream is formed by the polyzoal limestone for a distance of about half a mile below the section just described, and the rock is carved into miniature caves and hollows by the stream. The top of the limestone approaches the level of the river as we go down stream, owing to the dip of the beds, and at last it disappears under the bed of the stream, its place being taken by the overlying grey clay. Just above Griffin's (see plan 5), where the clay first makes its appearance in the river bed, fossils are plentiful. The banks of the stream are steep and slippery, so that it is a matter of some difficulty to work at the beds. The top of the clay bed is only about a couple of feet above the summer level of the river, and its eroded surface is covered by a gravel wash some ten or twelve feet in thickness.

The fossils found here were remarkable for their size, being far larger than examples of the same species occurring

elsewhere in the valley. We record 113 species from this locality.

For about half a mile below this the river bank exposes an almost continuous section of the clay bed, but this at last disappears, and is overlain by the gravel wash which covers the greater part of the valley.

To the northward on the hill side bounding the valley at (3) and (4), small exposures of the yellowish clay were seen, but only a couple of fossils were obtained. The hill side is thickly masked by soil, principally derived as a pluvial wash from the basalt above. In the places mentioned, however, small gullies have exposed the tertiary rock, though the exposures were so small that we could do no more than satisfy ourselves that the beds were continuous in that direction. Near Coghill's (see plan 2), the stream which has hitherto held a general south-easterly course, bends away to the southward. At this point, a very steep cliff is formed, exposing a section, which attracted the attention of the officers of the Geological Survey. At the base of the cliff occur billowy hillocks formed by the weathering of a small landslip.

The geological survey sheet gives the following section:—

Black loam, with estuary shells and nodules of limestone ... ..	8 ft.
Lava ... ..	30 „
Loose sand ... ..	6 „
Sandy clays, with miocene tertiary fossils ... ..	56 „
Total ...	100 ft.

This section, however, seems to need several modifications. The upper surface of the basalt is wackenitic in character, and passes up into the surface soil, and we could not find any trace of the estuary deposit referred to. After a prolonged search, about a dozen specimens of shells were discovered lying close to one another, on the face of the slope towards the cliff. These were all recent species, and are not peculiarly estuary shells. Their colours were perfectly preserved, and they did not appear to have been long in the position in which they were found. The shells were of species of large size, and no examples of small shells were found. The height of the place above the sea

is about 200 ft., and there is no evidence elsewhere, of such a great elevation of the coast within recent times. It seems probable that the shells were carried there by human agency, as similar collections of shells forming the "kitchen middens" of the blacks, are not unknown in other places. A careful examination of the soil did not show any quartzose sand, and the ant-heaps near the spot are covered with small pieces of scoriaceous basalt. Had there been any quartz sand in the deposits, traces of it would certainly have been found on the ant-heaps. Limestone nodules occur, but they are not unknown in decomposed basalt nearer Melbourne, and similar masses may be found near the railway cutting in Royal Park, the lime being probably derived from the decomposition of a lime felspar. A few angular fragments of quartz and quartzite were found on the surface, but are exceedingly scarce. There is certainly no evidence of a marine deposit overlying the basalt anywhere near this locality.

With regard to the 6 ft. of loose sand mentioned on the quarter-sheet, as underlying the basalt, this seems very local in its development. In most places, the clay beds which, as before mentioned, become more sandy in their upper portion, are directly overlain by the basalt, but in a few spots, loose sand does occur. There is no difference in colour between the loose sandy beds, and those containing a small admixture of clay, both being fawn-coloured. The bed of sand is marked Older Pliocene on the map, and is represented as having a continuous outcrop for miles up the valley. The evidence for its separation from the underlying beds is exceedingly slight.

We record 106 species from this locality.

From Coghill's to the Orphanage Hill, the ridge on the left bank maintains a fairly uniform height of about 200 ft. above the river, and falls away gradually on the eastward towards Corio Bay. The country on the right bank had evidently suffered extensive denudation before the basalt outflow took place. The survey quarter-sheet shows the basalt coming right down to the river's edge, from Coghill's to Fyansford (its upper surface being only about 50 ft. or 60 ft. above), while on the other bank, the base of the basalt is about 170 ft. above the river. It is possible, however, that the face of the hill is merely covered by the *débris*, and that the flow is not as deep as shown. For instance, the road-

cutting leading westward from the Eynsford Bridge gives an exposure of the tertiary strata a few feet in extent, at a height of about 40 ft. above the stream. The exposed rock is the yellow clay, with calcareous nodules, so constantly occurring near the top of the series in the neighbourhood. The only fossil we found was an oyster; but a more careful search would probably yield more forms. The tendency of the basaltic *débris* to completely mask a hill side, thus giving an erroneous view of the depth of the flow, is well shown in various places in the valley; and here, when walking along the river bank a few days before noticing the outcrop above, we had no idea that the geological boundary needed a correction. The difference in the level of the basalt on the two sides of the valley is a marked one. Standing on Orphanage Hill, far below the level of the base of the flow, one can see for miles over the basalt plain to the westward; and extensive denudation must consequently have taken place both before and after the outflow of igneous rock.

The geological quarter-sheet gives 10 ft. of loose sand underlying the basalt. This in the map is coloured yellow, indicative of Older Pliocene, and the outcrop is shown extending far up the valley. There is, however, but little doubt as before mentioned, that the deposit is of the same age throughout, and no sufficient grounds exist for dividing it into two parts. The change from clay to sand is a gradual one, which can be traced as we go up the hill on any of the sections exposed in the valley. The change in the character of the sediment naturally affected the inhabitants of the sea, but the fossils which occur in the sandy strata occur in the argillaceous beds as well, and no new forms appear.

The Orphanage Hill section is a very typical one. The grey clays at the base become yellow as they pass upwards, and calcareous nodules and bands make their appearance in the more arenaceous rock near the summit. The beds have been energetically searched for fossils by some of the Geelong collectors, and consequently good specimens are now somewhat difficult to procure. However, as a result of visits on various occasions, we have procured specimens of 192 species from the locality.

In speaking of the polyzoal rock of Western Victoria, Mr. Dennant\* mentions that at Muddy Creek the limestone

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\* "Proc. A.A.A.S.," 1890, p. 442.

occurs at a lower level than do the gastropod beds, though the actual contact cannot be seen. In South Australia, also, Professor Tate\* states that the polyzoal rock is the older of these two members of the series. The evidence we have adduced shows that in this locality as well, the sequence of the beds, as might have been expected, is similar. The deposit at Orphanage Hill, and consequently its extension up the valley of the river is usually spoken of as Oligocene, though coloured Miocene in the quarter-sheet; while the Wauru Ponds rock, which, like the Batesford limestone, is true polyzoal rock, is called miocene. This is, however, a reversal of the true sequence, for the limestone is undoubtedly the underlying member of the series. In his exhaustive examination of the Muddy Creek beds, Mr. Dennant† states that the whole series must be referred to eocene age, and the list of fossils we give, shows that no very marked difference if any at all exists between the ages of the gastropodous clays in the two localities.

#### OTHER TERTIARY DEPOSITS.

We paid but little attention to the other tertiary deposits. The basalt capping the hills is a portion of the extensive flow of our western plains. The source of the rock is not apparent at any rate in the immediate neighbourhood.

The river valley is covered in most places by drift, varying from fine sand to coarse gravel, consisting principally of quartz. Near Madden's, some greenstone pebbles were obtained, resembling those of the Barwon drift, both above and below the junction with the Moorabool. In the case of the former stream, they are probably derived from the gabbro outcrop, marked on the survey map as occurring about six miles above the junction; but the origin of the pebbles in the Moorabool is not clear. The drift is marked on the geological map as being of pliocene age.

Our thanks are due to Mr. J. Dennant, F.G.S., F.C.S., &c., for his kind assistance in the identification of many of the fossils.

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\* "Trans. Roy. Soc. S. Aust.," 1884.

† "Trans. Roy. Soc. S. Aust.," 1888, and "Proc. A. A. A. S.," *loc. cit.* See also "Trans. Roy. Soc. Vict.," 1891, p. 63.



The following shows the number of specimens recorded from each of the localities dealt with in the paper:—

TABLE I.

Filter Quarries	...	...	16
Upper Quarry	...	...	14

TABLE II.

Orphanage Hill	...	...	192
Coghill's ...	...	...	106
Griffin's ...	...	...	113
Near Madden's	...	...	35
Near Viaduct	...	...	122

The whole number of species is 295, and of these the mollusca and brachiopoda amount to 264.

In comparing the latter with eocene fossils of Muddy Creek, as recorded by Mr. Dennant, we find 145 common to both deposits, and as 102 of the remainder have been only determined generically, being as yet undescribed, it will be seen that the agreement between the beds is exceedingly close.

TABLE I.

NAME OF SPECIMEN.	LOCALITY WHERE OBTAINED.	
	* Filter Quarries.	Upper Quarry.
<i>Foraminifera.</i>		
Orbitoides mantelli ... ..	X	X
Amphistegina sp. ... ..	...	X
Operculina sp. ... ..	...	X
Gypsina sp. ... ..	...	X
<i>Corals.</i>		
Placotrochus deltoideus, Duncan ... ..	X	...
„ elongatus, Duncan ... ..	X	...
Flabellum gambierense, Duncan ... ..	X	...
Isis sp. ... ..	X	...
<i>Echinodermata.</i>		
Pericosmus gigas, McCoy ... ..	X	X
„ sp. ... ..	X	...
Clypeaster gippslandicus, McCoy ... ..	X	X
Monostychia australis, McCoy ... ..	X	...
<i>Brachiopoda.</i>		
Waldheimia garibaldiana, Davidson ... ..	X	X
Magasella compta, Sow ... ..	X	...
„ woodsiana (?), Tate ... ..	X	...
Terebratulina davidsoni, Etheridge ... ..	...	X
<i>Lamellibranchiata.</i>		
Pecten murrayanus, Tate ... ..	X	X
„ polymorphoides, Zittel ... ..	X	...
„ subbifrons, Tate ... ..	...	X
Spondylus pseudo-radula, McCoy ... ..	...	X
Nucula sp. ... ..	...	X
Ostræa sp. ... ..	X	X
<i>Gasteropoda</i> (a few casts) ... ..	...	X
<i>Pisces.</i>		
Lamna sp. ... ..	X	...

\* NOTE.—These quarries are both in the Polyzoal Rock, and are marked Filter Quarries (7), and Upper Quarry (8), on the plan.

TABLE II.

NAME OF SPECIMEN.	LOCALITY WHERE OBTAINED.				
	Orphanage Hill.	Coghill's.	Griffin's.	Near Madden's.	Near Viaduct.
<i>Foraminifera.</i>					
Orbitoides mantelli ...	...	...	X	X	...
Other genera and species ...	X	...	X	X	X
<i>Corals.</i>					
Placotrochus deltoideus, Duncan ...	X	X	X	...	X
„ elongatus, Duncan ...	X	X	X	...	X
Flabellum gambiense, Duncan ...	X	X	X	...	X
„ victoriæ, Duncan ...	X	X	...	X	X
Notoeyathus viola, Duncan ...	...	X	X	...	...
„ australis, Duncan ...	...	X	X	...	...
„ sp. ...	...	...	...	X	...
Trematotrochus (?) sp. ...	...	...	X	...	...
Balanophyllia australiensis, Duncan ...	X	X	...	...	X
Other species ...	X	X	X	X	...
<i>Echinodermata</i> (indeterminate casts ; also spines) ...					
...	X	X	X	X	X
<i>Crustacea</i> ...					
...	...	X	...	X	...
<i>Polyzoa</i> (various species) ...					
Salenaria sp. ...	X	X	X	X	X
...	...	...	X	...	...
<i>Brachiopoda.</i>					
Waldheimia garibaldiana, Davidson ...	X	X	X	...	X
„ insolita, Tate ...	...	X	...	...	X ?
„ corioensis, McCoy ...	...	X	...	...	X
Terebratulula vitreoides, T. Woods ...	X	X ?	...	...	..
Terebratulina scoulari, Tate ...	...	X ?	...	...	...
„ sp. ...	...	X	X	...	X
„ davidsoni, Etheridge ...	...	...	...	X	...
<i>Lamellibranchiata.</i>					
Pecten murrayanus, Tate ...	X	...	...	...	X
„ sturtianus, Tate ...	X	...	...	...	X
„ semilaevis, McCoy ...	...	...	...	...	X

NAME OF SPECIMEN.	LOCALITY WHERE OBTAINED.				
	Orphanage Hill.	Coghlin's.	Griffin's.	Near Madden's.	Near Viaduct.
<i>Lamellibranchiata</i> —continued.					
<i>Pecten yahlensis</i> , T. Woods ...	...	...	...	...	X
„ <i>zitteli</i> , Hutton ...	...	...	...	...	X
„ sp. ...	...	X	...	2 sp. (frag.)	X
„ <i>foulcheri</i> , T. Woods ...	...	X	...	...	...
„ <i>gambierensis</i> , T. Woods ...	...	...	X	...	...
<i>Spondylus pseudoradula</i> , McCoy ...	X	X	X	...	X
<i>Dimya dissimilis</i> , Tate ...	X	X	...	X	X
<i>Pectunculus m'coyii</i> , Johnston ...	X	X	X	X	...
„ <i>cainozoicus</i> , T. Woods ...	X	...	X	...	...
<i>Limopsis belcheri</i> , Adams and Reeve ...	X	X	X	X	X
„ <i>aurita</i> , Brocchi ...	X	X	...	X	X
<i>Lima bassii</i> , T. Woods ...	X	...	...	...	...
„ <i>linguliformis</i> (?), Tate ...	X	...	...	...	...
<i>Leda vagans</i> , Tate ...	X	X	X	X	X
„ <i>obolella</i> , Tate ...	X	...	...	...	...
„ <i>apiculata</i> , Tate ...	...	X ?	...	...	X
„ sp. ...	X	...	...	...	X
„ sp. ...	...	...	...	X	...
<i>Trigonia tubulifera</i> , Tate ...	X	X	...	...	...
<i>Barbatia celleporacea</i> , Tate ...	X	...	...	...	X
<i>Macrodon cainozoicus</i> , Tate ...	X	...	...	X	X
<i>Cardita gracilicostata</i> , T. Woods ...	X	X	...	X	X
„ <i>compacta</i> , Tate ...	X	X	X	...	X
„ <i>scabrosa</i> (?), Tate ...	X	...	...	...	X
„ sp. nov. (?) ...	X	...	...	frag.	...
„ <i>polynema</i> , Tate ...	X	...	...	...	...
„ <i>delicatula</i> , Tate ...	X	X	X	...	...
„ sp. ...	...	...	...	...	X
<i>Nucula tumida</i> , T. Woods ...	X	X	X	...	...
„ <i>morundiana</i> , Tate ...	X	...	...	...	...
„ <i>atkinsoni</i> , Johnston ...	...	...	...	...	X
<i>Chama lamellifera</i> , T. Woods ...	X	...	X	...	X
<i>Myodora tenuilirata</i> , Tate ...	X	...	X	...	X
<i>Semele vesiculosa</i> , Tate ...	X	...	...	...	...
<i>Cytherea eburnea</i> , Tate ...	X	X	X	...	X
„ sp. ...	X	...	...	...	...
<i>Chione</i> sp. ...	X	...	X	...	X
„ sp. (nov.) ...	...	...	X	...	...

NAME OF SPECIMEN.	LOCALITY WHERE OBTAINED.				
	Orphanage Hill.	Coghill's.	Griffin's.	Near Madden's.	Near Viaduct.
<i>Lamellibranchiata</i> —continued.					
Chione sp. ...	...	...	...	...	...
Crassatella dennanti, Tate ...	X	...	X	...	X
„ astarteformis, Tate ...	X	X	X	...	X
Ostrea lyotis ...	X	...	...	...	X
„ sp. ...	X	X	...	X	X
Cardium antisemigranulatum, McCoy ...	X	...	...	...	...
„ sp. ...	X	...	...	...	...
Cucullaea corioensis, McCoy ...	X	...	X	...	...
Corbula ephamilla, Tate ...	X	X	X	...	X
„ pixidata, Tate ...	X	X	X	...	X
Hinnites corioensis ...	...	X	...	...	X
Modiola sp. ...	...	...	X	...	...
<i>Gasteropoda</i> .					
Typhis laciniatus, Tate ...	...	...	X	...	...
„ sp. ...	...	X	...	...	X
„ m'coyii, T. Woods ...	...	X	...	...	...
„ evaricosus, Tate ...	...	...	X	...	...
Murex lophoessus, Tate ...	X	...	...	...	...
„ velificus, Tate ...	X	...	...	...	X
„ amblyceras, Tate ...	X	X	...	...	...
„ trochispira, Tate ...	X	...	...	...	...
„ camplytropis, Tate ...	X	...	...	...	...
„ eyrei, T. Woods ...	X	...	...	...	...
„ asperulus, Tate ...	X	X	...	...	X
„ sp. ...	...	...	...	...	X
Trophon polyphyllus, T. Woods ...	X	X	...	...	...
Ranella prattii, T. Woods ...	X	X	X	...	X
Rapana aculeata, Tate ...	X	...	X ?	...	...
Triton cyphus, Tate ...	X	...	X	...	X
„ tumulosus, Tate ...	X	...	X	...	X
„ woodsii, Tate ...	X	X	X	...	X
„ gemmulatus, Tate ...	...	...	...	...	X
„ tortirostris, Tate ...	...	...	X	...	X
„ textilis, Tate ...	X	...	...	...	...
„ sp. ...	X	...	...	...	...
Fusus dictyotis, Tate ...	X	...	...	...	...
„ craspedotus, Tate ...	X	X	...	...	...

NAME OF SPECIMEN.	LOCALITY WHERE OBTAINED.				
	Orphanage Hill.	Coghill's.	Griffin's.	Near Madden's.	Near Viaduct.
<i>Gasteropoda</i> —continued.					
<i>Fusus acanthostephes</i> , Tate ...	x	x	...	...	x
„ <i>foliaceus</i> , Tate ...	x	...	x	...	...
„ <i>aciformis</i> , Tate ...	...	...	x	...	...
„ <i>senticosus</i> , Tate ...	x	...	...	...	...
„ <i>hexagonalis</i> , Tate ...	x	...	...	...	...
<i>Fasciolaria cryptoploca</i> , Tate ...	x	...	...	...	...
„ <i>decipiens</i> (?), Tate ...	x	...	...	...	...
„ <i>rugata</i> , Tate ..	x	x	x	...	...
„ <i>cristata</i> , Tate ...	...	...	x	...	...
<i>Peristernia subundulosa</i> , Tate ...	x	...	...	...	x
„ <i>lutea</i> , Tate ...	...	...	x	...	...
<i>Sipho</i> sp. ...	..	x	2 sp.	...	...
„ <i>asperulus</i> , Tate ...	x	...	...	...	x
<i>Siphonalia</i> , sp. ...	x	...	...	...	...
<i>Dennantia imo</i> , T. Woods ...	x	...	...	...	...
„ <i>cingulata</i> (var.), Tate ...	x	x	x	...	...
<i>Leucozonia</i> sp....	...	x	...	...	...
<i>Nassa tatei</i> , T. Woods ...	x	x	x	x	x
<i>Voluta hannafori</i> , McCoy ...	x	...	x	...	...
„ <i>antiscalaris</i> , McCoy ...	x	x	...	...	x
„ <i>strophodon</i> , McCoy ...	x	x	...	...	x
„ <i>ancilloides</i> , Tate ...	x	...	...	...	...
„ <i>m'donaldi</i> , Tate ...	x	...	...	...	...
<i>Voluta costellifera</i> , Tate ...	x	...	...	...	x
„ ( <i>volutoconus</i> ) <i>conoidea</i> , Tate ...	x	...	...	...	...
„ <i>pseudolirata</i> , Tate ...	x	...	...	...	...
„ <i>cathedralis</i> , Tate ...	x ?	...	...	...	...
„ sp. nov. ...	...	...	...	...	x
„ <i>polita</i> , Tate ...	...	...	...	...	x
„ sp. ...	...	...	...	...	x
<i>Lyria harpularia</i> (?), Tate ...	x	...	...	...	...
<i>Mitra atractoides</i> , Tate ...	x	...	...	...	...
„ <i>alokiza</i> , T. Woods ...	x	...	...	...	...
„ <i>ligata</i> , Tate ...	x	x	x	...	x
<i>Marginella woodsii</i> , Tate ...	x	x	...	..	x
„ <i>propinqua</i> , Tate ...	x	x	x	...	x
„ <i>wentworthi</i> , T. Woods ...	x	...	juv.	x	x
„ <i>inermis</i> , Tate ...	x	...	...	...	...

NAME OF SPECIMEN.	LOCALITY WHERE OBTAINED.				
	Orphanage Hill.	Coghill's.	Griffin's.	Near Madden's.	Near Viaduct.
<i>Gasteropoda</i> —continued.					
<i>Marginella</i> (juv.) ...	x	...	...	...	...
„ micula (var.), Tate ...	...	...	...	...	x
„ sp. ...	...	...	...	...	x
<i>Oliva</i> , sp. ...	x	...	...	...	...
<i>Ancillaria pseudaustralis</i> , Tate ...	x	...	x	...	...
„ sp. ...	x	...	...	...	...
„ sublaevis (?), T. Woods ...	...	x	...	...	...
<i>Harpa</i> sp. ...	x	...	...	...	...
<i>Cancellaria varicifera</i> , T. Woods ...	x	x	..	...	x
„ sp. ...	...	...	...	x	...
„ laticostata, T. Woods ...	x	...	...	..	x
<i>Terebra platyspira</i> , Tate ...	x	...	...	...	...
<i>Pleurotoma haastii</i> , Hutton ...	x	x	x	...	x
„ murndaliana, T. Woods ...	x	x	...	...	x
„ clarae, T. Woods ...	x	x	x	x ?	x
„ sp. ...	x	x	x	...	...
„ ...	2 sp.	...	...	...	...
„ ...	...	6 sp.	...	...	...
„ ...	4 sp.	...	...	...	...
„ ...	...	...	...	...	4 sp.
<i>Drillia trevori</i> , T. Woods ...	x	x	x	...	x
„ integra, T. Woods ...	x	x	x	..	x
„ ...	6 sp.	...	...	...	...
„ ...	6 sp.	...	...	...	...
„ ...	2 sp.	...	...	...	...
„ ...	...	...	...	...	1 sp.
<i>Mangelia</i> ...	7 sp.	...	..	..	...
„ ...	3 sp.	...	...	...	...
„ ...	4 sp.	...	...	...	...
„ ...	...	...	...	...	5 sp.
„ bidens, T. Woods ...	x	x	x	...	x
<i>Bela</i> sp. ...	x	...	...	...	...
<i>Conus hamiltonensis</i> , Tate ...	x	...	...	...	...
„ (aff. pullulescens), T. Woods ...	...	x	...	...	...
„ sp. ...	x	..	...	...	...
„ ligatus, Tate ...	x	...	x	...	...
<i>Cypraea eximia</i> , McCoy ...	x	...	juv.	x ?	x
„ gigas, McCoy ...	x	frag.	x	...	frag.

NAME OF SPECIMEN.	LOCALITY WHERE OBTAINED.				
	Orphanage Hill.	Coghill's.	Griffin's.	Near Madden's.	Near
<i>Gasteropoda</i> —continued.					
<i>Cypraea leptorhyncha</i> , McCoy ...	x	x	...	...	x
„ <i>contusa</i> , McCoy ...	x	...	...	...	x ?
„ <i>pyrulata</i> , Tate ..	x	...	...	...	...
„ <i>subsidua</i> , Tate ...	x	...	...	...	...
„ <i>subpyrulata</i> , Tate	x	...	...	...	...
„ sp. ...	...	x	..	...	x
„ sp. ...	...	...	x	...	...
<i>Trivia avellanoides</i> , McCoy ...	x	x	x	...	x
<i>Cassis exigua</i> , T. Woods ...	x	...	...	...	frag.
<i>Semicassis transenna</i> , Tate ...	x	...	...	...	...
<i>Cassidaria</i> sp. ...	x	...	...	...	...
<i>Natica hamiltonensis</i> , T. Woods ...	x	x	x	...	x
„ <i>gibbosa</i> , Hutton ...	x	x	x	...	...
„ <i>polita</i> , T. Woods ...	x	x	x	...	x
„ <i>auriculata</i> , Tate, m.s.	x	..	...	...	...
„ (?) sp. (nov.) ...	...	..	...	...	x
<i>Crepidula</i> sp. ...	x	...	...	...	...
<i>Calliostoma</i> sp. ...	x	...	2 sp.	x	...
<i>Astele</i> sp. ..	...	...	...	...	x
<i>Xenophora agglutinans</i> , Lam. ...	x	...	...	...	x
<i>Solarium acutum</i> , T. Woods ...	x	...	..	...	x
<i>Scalaria</i> sp. ..	x	...	...	...	...
<i>Turritella murrayana</i> ...	x	x	x	...	...
„ ...	4 sp.	...	...	1 sp.	...
„ ...	...	3 sp.	...	...	...
„ ...	...	...	4 sp.	...	...
„ ...	...	...	...	...	3 sp.
<i>Siliquaria squamulifera</i> , Tate, m.s.	x	x	x	...	x
„ sp. nov. ...	x	...	x	...	...
<i>Eulima danae</i> , T. Woods ...	x	...	...	...	...
„ sp. ...	...	x	...	...	...
<i>Niso psila</i> , T. Woods ...	x	x	x	..	x
<i>Cerithium apheles</i> , T. Woods ...	x	x	x	...	x
„ sp. ...	x	...	x	...	...
„ sp. ...	...	x	...	...	...
<i>Triforis wilkinsoni</i> , T. Woods ...	x	...	...	...	...
„ ...	3 sp.	...	...	...	...
„ ...	...	...	2 sp.	...	...



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	Orphanage Hill.	Coghill's.	Griffu's.	Near Madden's.	Near Viaduct.
<i>Gasteropoda</i> —continued.					
Triforis ... ..	...	...	..	...	1 sp.
Mathilda sp. ... ..	X	...	...	...	...
Liotia sp. ... ..	X	...	...	...	...
„ sp. ... ..	...	...	X	...	...
„ sp. ... ..	X	...	...	...	...
Cyclostrema (?) sp. ... ..	...	...	...	...	X
Fissurellidæa malleata, Tate ... ..	X	X	X	...	...
Hemitoma oclusa, Tate, m.s. ... ..	...	...	X	...	X
Emarginula candida, Tate, m.s. ... ..	X	...	...	...	...
„ sp. ... ..	X	X	...	...	...
„ sp. ... ..	X	...	...	...	...
„ cymbium (?), Tate, m.s. ... ..	...	...	...	...	X
„ sp. ... ..	...	...	X	...	...
Entalis mantelli, Zittel ... ..	X	X	X	X	X
„ annulatum, Tate ... ..	X	X	X	X	X
Dentalium aratum, Tate ... ..	X	X	X	X	X
Cylichna exigua, T. Woods ... ..	X	...	X	...	...
„ sp. ... ..	X	...	...	...	...
„ sp. ... ..	...	...	...	...	X
„ sp. ... ..	...	...	X	...	...
Dolichotoma sp. ... ..	X	X	X	...	X
Magilus sp. ... ..	...	...	...	...	X
Vermetus (?) sp. ... ..	X	...	X	...	X
Scaphander fragilis, Tate, m.s. ... ..	X	...	...	...	...
Bulla scrobiculata ... ..	X	...	...	...	...
„ sp. ... ..	...	X	...	...	X
Ringicula australis (?) ... ..	X	...	...	...	...
„ sp. ... ..	...	...	X	...	...
Pusianella hemiothone ... ..	...	X	...	...	...
„ sp. ... ..	X	...	...	...	...
„ sp. ... ..	...	...	...	...	X
Columbella cainozoica, T. Woods ... ..	...	X	...	...	X
Clathurella sp. ... ..	...	X	...	...	...
Daphnella gracillima, T. Woods ... ..	...	...	X	...	...
„ sp. (?) ... ..	...	X	...	...	...
Delphinula sp. ... ..	...	X	...	...	...
Eburnopsis sp. ... ..	...	...	X	...	...
Rissoa (?) chrysalida, Tate, m.s. ... ..	...	...	X	...	...



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<i>Gasteropoda</i> —continued.					
Trochocochlea (?) sp. ...	...	...	x	...	...
<i>Cephalopoda.</i>					
Aturia australis, McCoy ...	x	...	...	...	...
Nautilus sp. ...	x	...	...	...	...
<i>Pisces.</i>					
Shark's teeth (2 species) ...	x	...	...	x	...
Ear bones ...	...	x	x	3 sp.	x